NATIONAL TRANSPORTATION SAFETY BOARD

IN RE:	
THE EL FARO INCIDENT OFF THE COAST OF THE BAHAMAS ON OCTOBER 1, 2015	NTSB Accident No. DCA16MM001

Interview of: ARTHUR A. ALLEN

Thursday,
March 3, 2016

Via teleconference

BEFORE:

JON FURUKAWA, NTSB
PAUL WEBB, U.S. Coast Guard
PATTY FINSTERBUSCH, TOTE Services

This transcript was produced from audio provided by the National Transportation Safety Board.

APPEARANCES:

On Behalf of the Interviewee:

LT. [redacted]
U.S. Coast Guard
JAG Corps

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_____Arthur Allen_____

TAKEN ON

_____March 3, 2016_____

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NO CORRECTIONS NEED. _____
Initials

_____Arthur A. Allen_____
Printed Name of Person providing the above information

_____ _____
Signature of Person providing the above information

_____April 1, 2016_____
Date

P-R-O-C-E-E-D-I-N-G-S

3:04 p.m.

MR. FURUKAWA: It is the 3rd of March, 2016, Thursday. It's 1504 Eastern Standard Time. We're here to do a phone interview with Mr. Arthur A. Allen, the Coast Guard oceanographer, concerning the El Faro sinking back in the 1st of October, 2015. Mr. Allen's role was SAROPS and advisory. Mr. Allen, do you acknowledge that this interview is being recorded?

MR. ALLEN: Yes, I acknowledge that it's being recorded.

MR. FURUKAWA: Okay. Do you acknowledge that we've discussed the NTSB mandatory briefing items?

MR. ALLEN: Yes, we have discussed them.

MR. FURUKAWA: Then for the sake of the court reporter that's going to be transcribing this, we'll go around and introduce our names and our affiliation, so they can transcribe it. This is Jon Furukawa, NTSB. I'm the survival factors group chairman.

MR. WEBB: This is Paul Webb. I am the Coast Guard representative on the survival factors group.

LT. [redacted] This is [redacted] I'm the counsel for the witness.

MS. FINSTERBUSCH: This is Patty Finsterbusch. I'm from TOTE Services.

MR. ALLEN: This is Arthur Allen from U.S. Coast Guard Headquarters, Office of Search and Rescue.

MR. FURUKAWA: Paul, why don't you take it away.

MR. WEBB: Okay, Art. I'm going to start out, just if you can explain your background, education, and how long you've been in the position you've been and with the Coast Guard.

MR. ALLEN: I graduated from the University of Massachusetts in 1975 with a Bachelor of Science in Aquatic Science and Engineering. I then went on to Dalhousie University in Halifax, Nova Scotia, where I received my Master's of Science in Physical Oceanography, 1980. Prior to that, I worked two years with the Northeast Fishery Center as a marine technician.

Then from 1984 to 2004, I was an oceanographer at the U.S. Coast Guard Research and Development Center in Groton, Connecticut, where I was in basically the projects to study search and rescue. Then from August of 2004 to present, I'm the oceanographer for the U.S. Coast Guard Office of Search and Rescue. I'm housed here in New London, Connecticut

with the International Ice Patrol. My duties are basically to -- involve all manners of search and rescue, but particularly the development of the trajectory models used in SAROPS. I presume SAROPS is a well-known acronym by now -- the search and rescue optimal planning system. I have numerous Coast Guard reports, scientific publications on and about the field of oceanography, regarding the drift of common search and rescue objects, a well-known expert in that particular field. I also work with human physiologists on the survival modeling of people at sea. Then contacted, I guess, for books and other things. Anything else you would need to know about that, my background.

MR. WEBB: That's good, Art. Concerning the development of SAROPS, can you explain your involvement with that?

MR. ALLEN: SAROPS has two primary functions or portions. One is what's called the simulator. In the simulator, we set up -- it's a driven GUI -- graphical user interface software system, where you set up -- we use a Monte Carlo particle distribution. Monte Carlo particle means that we randomly distribute thousands to tens of thousands of particles, and each particle represents a potential search and rescue

object. The SAR controller's job is to select what that object is and, through a series of different processes, where that object got in trouble and when it got in trouble. We have, then, all of these simulated search objects, which we'll refer to as particles. They, then, are drifted 100 percent with the surface currents, and by my algorithms, how to transfer the surface winds to their motion relative to the water. We add those two vectors together for each particle, and that gets us total displacement over the ground. That's how we move particles from when they got into trouble to when we anticipate our search assets will get on scene.

That's the simulator part of the project and exactly how those particles is what's been the bulk of my career determining. The second part of the problem is given a search planner, he has limited on-scene resource powers, if you will, and he's got to place them optimally to detect those particles, i.e. search objects. That's what's the planner assists him in doing, by taking results from previous detection experiments, and we can then do complicated optimization routines to then get the best opportunity to detect the search objects in question.

That's a quick overview of SAROPS. I've

been involved with algorithm development, GUI development, providing the environmental -- inherent in this is that you have to have the winds and the currents, so I've been involved with the contractor in getting the proper winds and currents in. I reach out to U.S. Navy, NOAA, and academics who run these models to bring them in, and other sources of currents. I have a wide range of objects and duties, if you will, taking care and feeding of SAROPS and improving it. I do a lot of the prototype development of SAROPS algorithms and features, so I know pretty much intimately what's under the hood, so to speak.

MR. WEBB: Did you start this project from the beginning, or did you join it later?

MR. ALLEN: I've been involved with the Coast Guard's development of SAROPS from the very beginning.

MR. WEBB: Can you tell us why the Coast Guard developed SAROPS, and what tools did we have before that?

MR. ALLEN: SAROPS, backing up, has been operational for just slightly over nine years. It took us two months to roll it out, so we don't have an exact date. Basically, it was January and February, a two-month rollout period nine years ago. It was a

two-year development. Prior to that, we had two primary search planning tools, CASP, computer-aided search planning, which was an offshore program, very similar to SAROPS in theory. It was a Monte Carlo particle tool, fundamentally sound, but limited to the offshore, and was built to be one-to-one with the U.S. Navy's wind and current file, which were limited to a global offshore model. Then inside of that -- so for cases inside of, say, the 20 nautical mile limit, where we did not have the Navy model -- the Navy model didn't go, if you will, we had an automatic manual method. In other words, we took the -- someone had taken the Coast Guard SAR addendum and computerized it. It was a very limited, basically manual method, but it was on the computer. So both of these tools had significant shortcomings and, of course, two tools, and produced -- so we were in a bad way, if you will, 10 to 12 years ago, in terms of the Coast Guard's search planning tools. They were both replaced by SAROPS.

MR. WEBB: That was 2007?

MR. ALLEN: That would be correct, yes, January-February of 2007.

MR. WEBB: For a SAR controller, what's the process to train them on SAROPS? What's the process now, and what was it when it first rolled out?

MR. ALLEN: When it first rolled out, we got together what we called tiger teams, basically, from the U.S. Coast Guard's Search and Rescue school in Yorktown, the SAR school in Yorktown, augmented by myself and others from my office and from C2SAT (Phonetic), the Coast Guard Center for Command and Control, who were responsible for the contracting of SAROPS. Basically, we took instructors from the SAR school, plus our search subject matter experts, SMEs, myself, and we went to each district. We did a district at a time, and at sectors. Each SAR operator got a total of two days' training initially, and it was basically to show them all the buttons. Each week was a different district. I attended D5 and D1 and D17 and D13 (Inaudible).

That took us the January-February to get all the sectors and districts, the current crop of SAR controllers, trained in SAROPS. I must say that D5 was the first to be trained, and literally, we had anticipated a period of overlap between SAROPS and CASP. The first senior civilian that we trained got trained that day. That evening he went on watch and used SAROPS successfully. So there was no looking back. All of the SAR controllers, everywhere I went, were overwhelmed with how friendly the tool was to use

and how appreciative they were to have us come out and train them in it.

MR. WEBB: How is the training done now?

MR. ALLEN: The training is now done through the four-week SAR mission coordinator course at SAR school. New recruits coming on go to the SAR school (Simultaneous speaking). Yes, maritime search planning, correct.

MR. WEBB: That's in Yorktown, Virginia.

MR. ALLEN: That is correct.

MR. WEBB: Are you involved with any of the curriculum development for SAR school?

MR. ALLEN: Not specifically, but certainly in a more general sense, in that a good deal of the work that I develop and get into SAROPS has to then be taught there at SAR school. I do not get into specific courses. I have to say that instructors often come to me for further guidance, insight, questions, that sort of thing, on the topic set for which I am the expert.

MR. WEBB: The development team, how often does SAROPS get updated? What's the schedule for updates to the program?

MR. ALLEN: We basically are in a continuous update improvement cycle. Initially, it was quite rapid, after the initial deployment, to basically deal

with critical bug fixes, if you will. At that time, 2007, I think we were updating at the rate of about once every three to four months. Now, we have slowed down. The update rate for new features -- the bug features is probably in the order of six months, and significant new features in SAROPS will be of the order of about one year.

MR. WEBB: How many updates have there been since the first SAROPS came out?

MR. ALLEN: I don't have a number for you. I know we came out with 1.0, and we're now into 2.0 --

MR. WEBB: Point two.

MR. ALLEN: Two.

MR. FURUKAWA: Twenty point two?

MR. WEBB: Two point zero two. The date of the accident, what version -- on October 1st, what version were we operating with?

MR. ALLEN: We were operating with 2.0.1. There was, in effect, no 2.0.0.

MR. WEBB: Was this a major or a minor change to SAROPS?

MR. ALLEN: I would say it was a major change to SAROPS. The two series has been a major change.

MR. WEBB: Can you explain what was changed?

MR. ALLEN: Starting with basic SAROPS is written as extensions to our GIS, which is -- Esri is the company that provides our GIS. There was a number of things that had come together. One, we were previously on, I believe it was 9.3 of our GIS. They were no longer supporting 9.2 or 9.3, so we had to move to ArcGIS 10.2. That, in itself, was a major upgrade. The second major upgrade was that we had to get off the SAROPS server. The server's Microsoft 2003 was no longer supported or authorized by the Coast Guard for IT issues, and we had to move to Server 2009. Then we switched from a language switch, and then we also switched to a database approach, as opposed to a file server approach -- on a database so it was automatically saving. There was a several-year rewrite of SAROPS that went into that process.

MR. WEBB: When did that start?

MR. ALLEN: When did it start? I believe it took almost two years to do that, and we rolled it out by the end of July 2015.

MR. WEBB: Out of the things that were changed, what do you think is the most significant change?

MR. ALLEN: To the user, it was the switch to a database, so that there was kind of a continuous

feeding in and out of database. From a GUI/SAR user flow planning, it was pretty much the same. There were some changes in what we were presenting in the planner as to what he was seeing and how search patterns and sorties were handled.

MR. WEBB: Was there additional training that was needed prior to the SAROPS watch standers -- to allow them to use it? Did they have to get --

MR. ALLEN: Yes.

MR. WEBB: -- additional training?

MR. ALLEN: Yes, there was additional training required.

MR. WEBB: What was the training?

MR. ALLEN: The training consisted of -- again it was not done with an on-site training. It was done with -- SAR school developed a WebEx, an interactive WebEx, and each controller -- each sector in each district was required to attend the WebEx, get everyone through them. They held several of them because of rotations. The feedback from that was generally positive.

MR. WEBB: Was there a period of time after the WebEx before each command center came online and started using the 2.0? Was there some requirement to complete some problems prior to the launch of 2.0 for

each command center?

MR. ALLEN: My recollection is that each command center or each district deemed when they were ready to go fully over to 2.0, and that they did that as a district, so all sectors had to have received the training and whatever testing was involved. That's my recollection.

MR. WEBB: With the rollout, did you encounter any problems with the 2.0 version?

MR. ALLEN: Yes, there were a number of minor issues that needed to be addressed. The reason is that there's no substitute for getting software into its full environment. SAROPS has connections with the SARSAT system, and we get alerts from the SARSAT system that's very difficult to test until we get it into the operations center. It also receives connections with Rescue 21, the Coast Guard's high sight system for delivering greater direction finding information to SAROPS. All these are difficult to test. We also had issues with -- this is a distributed system. SAROPS exists on multiple servers around the U.S. for connectivity and backup issues. There was issues initially with SAR controllers planning on one server and saving on another. That's my understanding of the sort of issues that we ran into.

MR. WEBB: So they would open it up on one server, and then save it to a different server?

MR. ALLEN: The saving is done automatically in the background. It's what they call archive and restore was having issues, I believe.

MR. WEBB: Okay. If they were saving it to a different server, they couldn't find what they were saving later on? Is that what happened?

MR. ALLEN: That is my understanding, but those -- I was not directly involved with those issues.

MR. WEBB: Moving on to the incident, itself, can you tell me when you got -- when you became aware of the El Faro incident?

MR. ALLEN: I believe I became aware of it like anyone else, through the news process, a regular citizen.

MR. WEBB: When you have a case like that that you know is going to be a major case, do you follow what the command centers are doing in SAROPS? Do you observe any of the SAROPS process going on?

MR. ALLEN: Typically, no.

MR. WEBB: During the case, when did you first get notified that they were having problems with SAROPS?

MR. ALLEN: I was not notified that they

were having problems with SAROPS.

MR. WEBB: So you got notified by their civilian there, Chris Eddy (Phonetic). What were the discussions that you had with him?

MR. ALLEN: For the record, Christopher Eddy, Chris Eddy is the senior SAR controller at District 7, which is Miami District and includes the area of responsibility where the El Faro went down. Chris Eddy called me to discuss the El Faro case.

MR. WEBB: Can you explain what was discussed?

MR. ALLEN: The discussion centered -- we had two conversations, I believe. The discussion centered around, initially, that, of course, this is an unusual case, in the sense that we're in a hurricane situation, and that my primary area of expertise is all of the search objects available in SAROPS. I recommended that he perhaps look for capsized life rafts, as opposed to upright life rafts. We discussed the open life boats that were on the El Faro and what would be the most appropriate equivalent boat to that, which is the Newfoundland skiff.

It has the same sort of dimensions and weight, and then the possibility of looking for what we have in SAROPS, which is fishing vessel debris, so

basically debris. That was where we were kind of looking initially. They were my suggestions as to what would be likely search objects for a vessel that had entered a hurricane.

MR. WEBB: Did you talk about the size of the El Faro and what search object would match that?

MR. ALLEN: Yes, in the sense that it was -- I forget exactly how far we were into the case, but at that point, they were searching, and it's pretty confident that if the El Faro was on the surface, they most likely would have detected it. We have pretty strong radars that could detect it. So the focus was if it's not on the surface. At that point, it was unclear whether it was on the surface or not. By focusing on what would be the object if it was not on the surface, that was the discussion.

MR. WEBB: What was the second conversation that you had with Chris?

MR. ALLEN: The second conversation centered around survival. Again, alluded to the fact that I work with the survival experts around the world, and particularly with the Coast Guard's survival tool (Inaudible) survival detection aid that's built by the U.S. Army labs in Natick, Massachusetts at (Inaudible) U.S. Army's Environmental -- give me a second -- want

the full acronym? I'll get that for you later.

MR. WEBB: Okay. PS (Simultaneous speaking).

MR. ALLEN: We discussed basically that, again, under these parameter set, which is full hurricane force winds, that survival is unlikely.

MR. WEBB: Why is that?

MR. ALLEN: The water was reasonably warm, so it's not an issue of water temperature taking heat away from them, classic hypothermia. The issue is two-fold. The sea surface in a full hurricane has large breaking waves, so you have just the issue of staying afloat and staying on the surface. It will exhaust people to death, if you will. The second part of that is when the hurricane is at its maximum, then the concept of a sea surface starts to go away, in that it's wind-blown foam and that sort of thing. There's not a distinct boundary layer between water and air, but there's sort of an interface in between that's filled with enough water to drown you, without enough water to support you, so survival is -- if you're in a person in water configuration, I should say. Also, in wind speeds of this sort, all of your survival craft, particularly open ones, life rafts and such, are very difficult to remain upright.

MR. WEBB: What about somebody in a survival suit?

MR. ALLEN: Again, the issue is keeping the head, in other words the mouth free and clear of water. Being repeatedly tossed by large waves, it's an extremely difficult survival situation.

MR. WEBB: With all these environmental issues of the hurricane, is there limitations in what SAROPS can produce for you in a way of drift -- basically the drift simulator, is it limited?

MR. ALLEN: It is not mathematically limited, but it is limited in the fact that our knowledge about how search objects behave in winds of this nature is -- it's beyond the realm for which I was able to get direct measurements from all of my 30 years of (Inaudible) drift experiments.

MR. WEBB: Will SAROPS actually produce -- in the high winds and seas at that point, will it actually produce a result that's --

MR. ALLEN: Yes.

MR. WEBB: Would you consider that accurate or inaccurate at that point?

MR. ALLEN: If you choose the right search object, I presume it will be accurate. What I mean by that is choosing objects such as capsized and swamped

life rafts, swamped skiff, fishing vessel debris. Within the realms of what we get for the models, it will be as accurate as we can hope for.

MR. WEBB: During the case, they went to the point that they were just going back to old school search and rescue planning of mini max (Phonetic). Were you aware of that?

MR. ALLEN: I was not aware of that.

MR. WEBB: During the case, they had a number of occasions where they had to rebuild SAROPS. Were you involved with any of the rebuild or discussions on how to rebuild it?

MR. ALLEN: I was not involved.

MR. WEBB: Who was?

MR. ALLEN: I believe the technical support team at C3CEN (Phonetic).

MR. WEBB: Would you have any idea why SAROPS would need to be rebuilt during the case?

MR. ALLEN: You would need to ask the technical folks at C3CEN.

MR. WEBB: I think I have --

MR. FURUKAWA: (Inaudible.)

MR. WEBB: Yes.

MR. FURUKAWA: This is Jon Furukawa from the NTSB. How many years of professional experience do you

have?

MR. ALLEN: I've been a civilian for the Coast Guard for 32 years now.

MR. FURUKAWA: So 32 years of professional oceanography experience?

MR. ALLEN: That is correct, applying it to search and rescue problems.

MR. FURUKAWA: Your highest degree is from Dalhousie University in physical oceanography (Simultaneous speaking)?

MR. ALLEN: That is correct.

MR. FURUKAWA: That was a Master's?

MR. ALLEN: (Simultaneous speaking.)

MR. FURUKAWA: Excuse me?

MR. ALLEN: Master of Science, that is correct.

MR. FURUKAWA: SAROPS was launched January-February of 2007, nine years ago.

MR. ALLEN: That is correct.

MR. FURUKAWA: When you were talking to Paul about survival unlikely, I think it was with the concept of sea surface goes away from the foam, the boundary layer?

MR. ALLEN: Yes. Fundamentally, in the ocean, unless there's trauma, which then, essentially,

the assumption is that everyone drowns, but they're drowned because of -- you have to protect your airway. If you can't keep your airway clear of water, whether that's because you're underwater or because of windblown spray, then you're drowned.

MR. FURUKAWA: How thick is this layer of foam or spray?

MR. ALLEN: Of course, it will depend upon the wind speed. It can be inches to a foot thick sort of approach. When you get into extreme seas, right at the sea surface, the water is getting airborne.

MR. FURUKAWA: You said it was difficult for a life raft to remain upright in those conditions?

MR. ALLEN: Yes. I did experiment off the Grand Banks of Newfoundland. That was conducted -- give me a second, here. The report is from 1997. We had winds up to 43 knots, so, if you will, half to a third of a hurricane force. Now, understand that the force of wind goes up as the square of the wind speed. So if there was 80 knots of wind, that's four times the force on something. During that time we had three skiffs out, of which two sunk and never came back to us. We were tracking all of these vessels. The one that we did recover was swamped. That's how we were able to recover the leeway of a swamped open skiff.

While we called them open skiffs, they were actually decked over to prevent this, so they were in pretty extreme wave conditions at 40 knots, if you will, of wind.

MR. FURUKAWA: You said there were four skiffs, and two of them sunk?

MR. ALLEN: Three skiffs, two sunk.

MR. FURUKAWA: The one that you recovered was swamped?

MR. ALLEN: That is correct.

MR. FURUKAWA: Those are open boats?

MR. ALLEN: They're designed to mimic open boats. This was a Canadian-sponsored experiment. Off of Newfoundland, they use these large open wooden dories. They go out fishing the Grand Banks. This was in the '80s and '90s. These guys have a single outboard on them. They often, at the end of the day, couldn't get the outboard operating again. So they were a common search object for the rescue coordination center in St. John's, Newfoundland. They provided the resources to study the leeway drift of these objects, and we did that for several years, kept repeating.

That year, which I believe was '95 or '96, and we were up there in November-December, the array of objects (Inaudible) were caught in a moderate storm.

But what was happening was I believe the wind shifted, so we had winds out of the North, and then out of the South. You had what we would call a confused sea. That's what led to the swamping and capsizing of many of our test search objects.

MR. FURUKAWA: So that wasn't mimicking; that was an actual storm with confused seas?

MR. ALLEN: Yes. The way my field studies are conducted is that I will choose a search object of interest, a life raft or skiff or something like that, and we will instrument it with essentially three different types of instruments. If it's large enough, like these skiffs, we will put a wind monitoring system directly on the skiff, so we get the winds at the skiff. We attach, in various different ways, a current meter. That current meter gets pulled through the water. The motion of that object to the water is, in fact, its leeway. Then we'll add things like all kinds of beacons and lights and radio direction finders and satellite beacons. So we can deploy these things; they can be autonomous, and then we can recover them, in the case off Newfoundland, one, two, or three days later.

MR. FURUKAWA: That was during a natural storm, correct?

MR. ALLEN: That is correct, yes,

November-December, Grand Banks, they're real storms.

MR. FURUKAWA: So you discussed life rafts and survival suits. How about an enclosed life boat -- the survivability of a closed life boat in those kind of conditions?

MR. ALLEN: One of the objects we have studied off Newfoundland was the 22-man SOLAS enclosed capsule. It's the orange boat you'll see often at the tail of a large boat or tanker or oil rig. I have to say because of the nature of the contract with the contractor and the Canadian Coast Guard, we only studied under pretty low wind conditions and limited wind conditions, but we do have a leeway of your classic enclosed life capsule, but we have not -- we did not put it out in extreme conditions.

MR. FURUKAWA: Are there any plans to put it out -- do an experiment in extreme conditions?

MR. ALLEN: Not that I'm aware of.

MR. FURUKAWA: What year was that study for the enclosed capsule?

MR. ALLEN: The report is Allen and Fitzgerald, 1997, and it's the leeway of an open boat and three life rafts in heavy weather, Coast Guard Report CG-D-03-98, and it's available through the National Tactical Information Service.

MR. FURUKAWA: You can get that, Paul?

PARTICIPANT: I can probably get that.

MR. WEBB: What was the number, again, on it, Art?

MR. ALLEN: CG-D-03-98.

MR. FURUKAWA: You did that at the same time that you were doing the Grand Banks experiment with the skiffs?

MR. ALLEN: Yes, that's the report that includes -- yes, that's the report from that field test.

MR. FURUKAWA: Art, do you have -- even though it was at low wind conditions, do you have a professional guess or a professional opinion of how an enclosed life boat would have done if these guys were able to -- I guess if it was like a gravity launched enclosed life boat -- what their chances of survival would have been?

MR. ALLEN: It would have been better. How much better, I can't say. I think egressing a vessel in distress is always difficult. You would certainly have to be strapped into the boat, because if you were not, then you would have been repeatedly tossed and rolled violently. But that's probably a question better left for people with more experience with those

survival boats.

MR. FURUKAWA: What's your professional opinion about the open boat, if they were able to launch one of those and get away from the ship?

MR. ALLEN: My opinion is that in these conditions, it would be very difficult for the boat to remain upright.

MR. FURUKAWA: You said that the study you did, the 22-man SOLAS enclosed capsule, that's similar or the same as one of those free fall life boats on the rigs or on the stern of ships?

MR. ALLEN: Yes. It was an actual life boat. It was not a model of one. We tested it in the open water. I can get you the reference for when we -- which reference? Let's see here.

MR. FURUKAWA: Is that still going to be in the same study?

MR. ALLEN: Give me -- life capsule, 29. That would be from a report that's Fitzgerald, et al., 1994, so an earlier study on the Grand Banks of Newfoundland.

MR. FURUKAWA: That one's called Fitzgerald and Allen?

MR. ALLEN: No, that will be -- it's Fitzgerald, Finlan, Fun and Allen (Phonetic), 1994,

Drift of Common Search and Rescue Objects, Phase 3, and it's a Canadian Coast Guard report, TP12179. All of these reports are summarized in two of my reports that are available, Review of Leeway Field Experiments and Implementation, Allen and Plurd (Phonetic), and Leeway Divergence, Allen, 2005.

MR. FURUKAWA: Review of Leeway -- what was the first one, Review of Leeway what?

MR. ALLEN: Review of Leeway Field Experiments and Implementation.

MR. WEBB: They available online?

MR. ALLEN: That is available online, yes.

MR. WEBB: Through --

MR. ALLEN: Through National Tactical Information Service. If it's not online, I have electronic copies.

MR. WEBB: It might be easier --

MR. FURUKAWA: Right.

MR. WEBB: -- for me to get it that way. If you want to just send that stuff to me, I would appreciate it.

MR. ALLEN: Paul, I sent you -- in my CV is all these references.

MR. WEBB: Okay.

MR. FURUKAWA: You also said you had 30

years of something drift experiments.

MR. ALLEN: Yes. Basically, when I came on to work for the Coast Guard R&D Center in 1984, it was an improvement in search and rescue. Whatever the project was in the group, it was the oceanography branch. We were working on search and rescue and, at that point, started to do comparison studies with CASP, the search planning tool at the time, computer aided search planning, and then went on to get involved with development of the self-located data marker buoy, and also, initially, I was studying the slippage of -- working with the Canadians on these large field experiments, and also locally, down in Florida. Yes, since the beginning, I've been conducting these experiments.

MR. FURUKAWA: Drift experiments, okay. Mini max? What's a mini max?

MR. WEBB: Art, you want to explain that?

MR. ALLEN: Yes, sure. The mini max, the manual method of determining where something would drift was a method that everything had to start from a point, and that point could be described as a circle. We often refer to that as last known position, or LKP for short. Then the controller used a number of estimates from winds and currents and an extremely

limited set of leeway equations -- before my work there were seven categories or something, and now they have more, of course -- to estimate how far it would drift left and right of the wind.

They would draw these circles, and then box these circles. The size of the circles was related to -- I believe it was distance from the beginning or something like that. There was lots of lots of assumptions and flaws that we no longer have to -- we've dealt with directly by having a use of particle approach and gridded winds and currents that we have (Inaudible).

MR. FURUKAWA: That's enough for me. Patty, do you have any questions for Art?

MS. FINSTERBUSCH: Hi, can you hear me?

MR. ALLEN: Yes, absolutely.

MS. FINSTERBUSCH: Okay, I guess my only question would be since the incident, has there been any request to add different search objects to SAROPS?

MR. ALLEN: Not specifically. When I visit command centers, that is one of the questions I ask, which is if you would like to see something added to our SAROPS, in terms of a search object, what would you like to be seen added? It takes me quite some time to set up and prepare for one of these experiments, so I

have to have ship time.

I automated a lot of the data analysis and can do that quite efficiently, but the setup is quite extensive. I'm just down from the Coast Guard Academy, so I do work with Coast Guard cadets. I think perhaps the next object of highest interest, in my opinion, is a flap (Inaudible). In other words, aircraft debris.

MS. FINSTERBUSCH: I guess the other question I have is along the same lines, on the SAROPS, what's the worst weather conditions that is figured in there?

MR. ALLEN: What we do is there's -- SAROPS is the environmental data -- in other words, we need two major pieces of information. We need to know what the surface currents are, and we need to know what the surface winds are. Surface winds are defined in meteorology models and across is the winds at 10 meters, 33 feet, if you will, above the sea surface. My leeway equations are related to the sea surface and to the 10-meter winds. We have an environmental data server. It is run by a contractor. That's a service that we engage in with them. They go on the schedule of the numerical models. The National Weather Service runs numerical models four times a day, and NOAA and the U.S. Navy and universities run numerical models of

currents typically daily.

We go to them on their schedule -- the EDS goes to them on their schedule, I should say, collects their now cast and forecast fields, archives the now cast fields, and then responds to requests from a SAROPS user to bring back the data queue, which is a lat/long time box, if you will, of the requested winds and currents that the user requests. He's doing that all through one of the graphical user interface pages within SAROPS. He has a pick list of products to choose from. The case, itself, defines the lat/long cube box. He selects it, and then of the order ten seconds later, that data is now on the SAROPS server, ready to make the trajectory analysis.

MS. FINSTERBUSCH: That was a bit complicated. I think I understood what you were saying, though. All right.

MR. ALLEN: In short, we have something like 36 different models of currents, and another 25 sources of winds that the controller can access at the touch of a button to do the actual drift trajectories.

MS. FINSTERBUSCH: That I understood. Thank you. I don't have any other questions.

(Inaudible.)

MR. FURUKAWA: Art, it's Jon Furukawa again.

MR. ALLEN: Okay.

MR. FURUKAWA: For the El Faro, what we understood from the interviews was that as far as inputting an object, there wasn't a drift model the size of the El Faro, and there wasn't a 40-foot life boat drift model. Are there any plans to, I guess, increase the size of vessels as drift models?

MR. ALLEN: Okay. There is, to my knowledge, a private company that does do the drift of large disabled vessels. This is primarily for vessels that have lost main propulsion, but may not have necessarily lost, say, the bow thrusters. The drift of very large vessels, super tankers and vessels of the Faro, require that you bring in the wave spectrum. That is what the wave conditions are as a function of direction and period, so it's a much more complicated problem. Then you have to have the superstructure cross section of the vessel, itself, because it's so large. So there is a program to do that. We have not investigated getting it.

MR. FURUKAWA: How about for a 40-foot life boat?

MR. ALLEN: I do not have direct access to a 40-foot life boat, so I have no plans to directly study one at this time. I am not aware of anyone else that

is planning on studying a 40-foot life boat.

MR. FURUKAWA: Life rafts, what's the largest life raft that you have in the SAROPS?

MR. ALLEN: The largest one we have studied is a 20-man circular life raft. That was part of those studies conducted by the Canadian Coast Guard off Newfoundland.

MR. FURUKAWA: What I understand, though, is even with the SAROPS, with all the different servers and all that, that during the El Faro case, it was still able to predict the debris field?

MR. ALLEN: Yes, and I would say that's a pretty good indication that everything was working. Just for reference, the leeway of fishing vessel debris is from a mid-1980s study done by some Japanese researchers, so it was done before there was the high-resolution current meters and such that we have today. It's the only information we have on drift of debris, a direct measurement of that -- or an indirect measurement. There's two approaches. The fact that they found it indicates (Inaudible) pretty much the system was working, the entire SAROPS simulation and detection system.

MR. FURUKAWA: For the 40-foot life boat, you used the Newfoundland skiff, was that what you

said?

MR. ALLEN: That is correct, yes.

MR. FURUKAWA: What's the length of a Newfoundland skiff?

MR. ALLEN: Give me a second. Its length is 553 centimeters, so 5.5 meters. I'll let you convert to feet. It's about 18-19 feet.

MR. FURUKAWA: What was the size of the vessel that you used in the model, do you remember? Was it 400 feet or something like that?

MR. WEBB: The coastal freighter that they used.

MR. FURUKAWA: The largest model for a ship in SAROPS.

MR. ALLEN: I think we kind of go up -- the ones that have been studied, or the ones that are available in SAROPS?

MR. FURUKAWA: That are in SAROPS.

MR. ALLEN: The largest one is from, again, an early Japanese study. I believe it was one of their fishing training vessels, and it was roughly the order of 200 feet.

MR. FURUKAWA: That's what was used for the El Faro?

MR. ALLEN: I do not know.

MR. FURUKAWA: You said there's 36 current variables and 25 wind variables?

MR. ALLEN: Not variables, fields, different sources of currents and winds available in SAROPS now. Some of them are very local, so they're not appropriate or cover the region -- the open ocean off of where the El Faro went down.

MR. FURUKAWA: I think the question Patty was asking was do you have an input for a Category 1, 2, 3, 4, and 5 hurricane in SAROPS?

MR. ALLEN: No. We bring in the wind fields as provided by either the Navy or the National Weather Service.

MR. FURUKAWA: Okay, because that's going to change for the -- pretty quickly with a hurricane, correct, all the way until --

MR. ALLEN: That is correct, yes, but we're basically reviewing the winds. We're getting a new wind field every three hours from -- we have the winds at three-hour intervals from the National Weather Service.

MR. FURUKAWA: That's from the hurricane reports, or is that just normal winds? The hurricane predictions come out every six hours, and then they'll go to every three hours when it's a larger storm.

MR. ALLEN: These are the numerical models run by the operational National Weather Service NCEP. NCEP is the National Center for Environmental Prediction. We do not go to the hurricane center. We go to the modelers that are providing us models day in and day out.

MR. FURUKAWA: That's every three hours for winds. How often are the current fields updated?

MR. ALLEN: They're updated once a day, but they're at one-hour intervals. There's an update rate, and then there's the data rate.

LT. [redacted] Art, this is [redacted] Let me just clarify. All these inputs that you're talking about, those go into the modeling. Those aren't the actual input that the SAROPS user would put in, right?

MR. ALLEN: He selects --

MR. WEBB: You've got to select it.

MR. ALLEN: Yes, the user has to select which product, but he is given guidance, and that guidance is provided by myself as a flow chart, and generally, the controllers have that flow chart printed out and pasted next to their SAROPS, or it's accessible within SAROPS. So for each region -- each district, and then each region within that district, it's if you are here, use these products in this order. If the

first product isn't available, move to the second, etc.

MR. WEBB: Art, this is Paul. With the wind and sea conditions that they had on scene, you would expect that SAROPS could still give you a drift model under those conditions?

MR. ALLEN: That is correct, Paul. As I said earlier, the fact that they found debris where SAROPS projected the debris would be is indication that the initial input's position was reasonably correct, but the winds that were provided by National Service was correct, the currents provided by the National Ocean Service was correct, and that the early 1980s Japanese study provided a reasonable estimate of leeway. Just a little bit further is that we assigned each of these 10,000 particles different leeway equations, so we are accounting for all uncertainties in the system as sort of a -- keep track of all the uncertainties and bring them through the SAROPS system.

MR. FURUKAWA: That's all I have. Paul?

MR. WEBB: Just to -- none of the conversations you had with Chris Eddy, there was no concerns over the stability of SAROPS or anything like that; it was just trying to pick out the correct search objects?

MR. ALLEN: I was making suggestions on what

is appropriate search objects, given hurricane conditions, and then we discussed survivability in hurricane conditions. Those were the two conversations.

MR. WEBB: On the survivability model, itself, with the conditions, can you plug in those conditions or hurricane conditions into that, and it will give you an answer, or is that past its capability?

MR. ALLEN: You can physically plug them in. Wind speed is one of the inputs, but it's taken only as a removal of heat from the person's head or exposed portion of body. It doesn't account for the additional physiological drain on the person due to wave action.

MR. WEBB: It doesn't take in effect the fact that the surface has turned to foam?

MR. ALLEN: That is correct, yes.

MR. WEBB: So basic information that comes out of the survivability model is hypothermia?

MR. ALLEN: That is correct. It's a heat generation from shivering versus heat loss to the environment model.

MR. WEBB: I think I am done.

MR. FURUKAWA: You're all done? Patty, anything for you?

MS. FINSTERBUSCH: No further questions for me.

MR. FURUKAWA: I guess we'll end it, then. Art, for ending an interview, we like to ask you is there anything that you'd like to add or change?

MR. ALLEN: Paul asked earlier about the upgrades to the SAROPS program. I now have that in front of me, so we can review that in probably a little bit. Why SAROPS was upgraded to 2.0 was one of the questions. There was a move -- as I said, we had to move from ArcGIS 9.0, Arc Map 9.3 to 10.2 because 9.3 was no longer supported by Esri. E-S-R-I is the company. We had to rewrite the SAROPS graphical user interface to a different programming language. The previous language was obsolete and was no longer supported by the Arc Version 10.2. We had to re-host Arc Map and SAROPS off the Microsoft Server -- we had to re-host it on to Microsoft Server 2008 and off of 2003.

This was because 2003 was no longer certified by the Coast Guard and DoD. Then we mentioned the method of handling its data with a database to improve (Inaudible) that was a major uptake. So SAROPS 2.01 was fielded, and all command centers were using it for SAR operations by 31 July,

2015. The training was done by webinars during June and July of 2015. The known bugs in 2001, which were corrected by January of 2016 -- so these are the bugs that we're dealing with at the time of the El Faro -- the archive restore did not work properly when working across server suites. (Inaudible) created on the East Coast suite, then accessed by an operator on the central server would fail upon archive actions. This is perhaps what happened. We're not sure. If the person entered a search object that was weighted zero -- you could weight your search objects -- then there was a probability of crash.

If they had put in fishing vessel debris, but weighted it zero, so that not to search on it, then that would have caused a crash. There was certain user active overlays and nautical raster charts from NOAA that would cause SAROPS to crash. There was a NOAA button that would cause NOAA (Inaudible) toolbar buttons. There was an -- offshore buoys were not working. We usually bring in the national data buoy -- the DBC buoys -- National Data Buoy Center -- as these offshore buoys. We were unable to access those. Those were the issues at the time of the El Faro case, and they have since been corrected.

MR. FURUKAWA: Okay. Are there any

questions that we should have asked, but did not?

MR. ALLEN: Should have asked, but not. Let me give a little bit of overview, explaining my role here again with Chris Eddy. The role here is as someone to advise or to talk through a problem. I'm not in the chain of command. I did not give directions of what they should do directly. Everything I do is a suggestion, act as a sounding board to them. This is the third, I would say, similar case to this that I've had in my career. There was a case where the oceanographer here at ice patrol, when he was senior controller at PAC area -- Pacific Area in Alameda -- a foreign-flagged vessel sailed directly into a typhoon, very similar case to this.

I believe nothing was found after that case. Then a similar situation with Paul Webb with a Korean fishing vessel lost off of Russia. Often, when it's a big case like this, several days into the case, the senior controllers and I will have a discussion to kind of just work through the case. The general background question is have we thought of everything? Have we done everything? That's my role is to kind of make -- to go through that process with them, independent of the formal chain of command.

MR. FURUKAWA: Okay. Question, did you work

with (Inaudible) by any chance?

MR. ALLEN: On the -- sorry, say again.

MR. FURUKAWA: Marine Electric (Phonetic). That was back in 1982.

MR. ALLEN: No, that was before I came to the Coast Guard.

MR. FURUKAWA: Before your time? Okay. Next question, do you have any suggestions for preventing a reoccurrence of an accident like this?

MR. ALLEN: I will leave that up to the National Transportation Safety Board.

MR. FURUKAWA: Well, we're asking you. Is there --

MR. ALLEN: Don't leave port into a hurricane.

MR. FURUKAWA: Last question, is there anyone else that we should interview?

MR. ALLEN: If you want the details on the SAROPS up and down during the El Faro case, then there are the folks at C3CEN. Paul, do you want a list of those?

MR. WEBB: Yes (Inaudible) record.

MR. ALLEN: That would be -- I think people of direct would be Robert Netsch, Cordel Vieweg (Phonetic), and John (Phonetic) Squires.

MR. FURUKAWA: Robert who?

MR. ALLEN: N-E-T-S-C-H.

MR. FURUKAWA: Okay, and the second person was?

MR. ALLEN: Cordel Vieweg.

MR. FURUKAWA: How do you think you spell Vieweg?

MR. WEBB: I've got the spelling.

MR. ALLEN: You got it, Paul? Okay.

MR. WEBB: I got it.

MR. FURUKAWA: The last one was Squires?

MR. WEBB: John Squires.

MR. FURUKAWA: John Squires, okay. That's about it. The time is 1623, and we're stopping the recording, stopping the interview with Mr. Art A. Allen, Coast Guard oceanographer.

(Whereupon, the above-entitled interview was concluded at 4:23 p.m.)

C E R T I F I C A T E

MATTER: El Faro Incident
Accident No. DCA16MM001
Interview of Arthur Allen

DATE: 03-03-16

I hereby certify that the attached transcription of page 1 to 45 inclusive are to the best of my professional ability a true, accurate, and complete record of the above referenced proceedings as contained on the provided audio recording; further that I am neither counsel for, nor related to, nor employed by any of the parties to this action in which this proceeding has taken place; and further that I am not financially nor otherwise interested in the outcome of the action.

[redacted]